Remarks by

Dr. James C. Fletcher, Administrator
National Aeronautics and Space Administration

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In my remarks today I would like to do three things:

Space in the 70's

One. I want to describe for you in general terms the space program for the Seventies as it has been worked out by the Administration and a strong bi-partisan majority in Congress.

Shuttle

Two. I want to stress the importance of proceeding with the Space Shuttle, as President Nixon recently recommended and as Congress has already tentatively approved.

Return

Three. I want to give you an accounting of the return we are getting, and expect to get, from our investment in space exploration and use.

Much has changed since Dr. Thomas O. Paine, my immediate predecessor as Administrator of NASA, spoke to the Calvin Bullock Forum in 1970.

With our goals of the Sixties so remarkably achieved, we have had to give careful consideration to the kind of space effort the country needs, can afford, and will pay for in this decade. characteristics

We have a businesslike program. By that I mean we will stress the attainment of greater practical benefits from space at sharply decreased costs. We will improve the technology of our working satellites and find valuable new uses for them.

We have an economy-minded program. We expect to be operating under limited budgets of three plus billion dollars per year for some time to come. This is half the funding NASA had year after year in the Sixties when the Apollo program was at a peak.

We have an Earth-oriented program. We are shifting our emphasis from the Moon to Earth orbit. We will end the Apollo program with two more flights to the Moon this year. We will not go back to the Moon in this decade. We will continue a strong program to explore the planets, but with unmanned spacecraft only.

We have a balanced program. In addition to stressing practical benefits, we will maintain strong programs in space science and in developing advanced technology for use in future decades. We will use unmanned spacecraft for the many jobs they can do best. But we will also maintain and strengthen U.S. capabilities to use men effectively in Earth orbit for scientific or practical work or for military missions. This decision to use men in space has been a crucial one for NASA, and I believe for the country.

We have a program that promotes and facilitates international cooperation. In the Sixties we sought to bolster our sagging prestige after Sputnik by getting clearly out in front again. We clearly accomplished that. In this decade we can best demonstrate our leadership and enhance our international prestige by working closely with other nations for mutual benefits from space. This is an important element in the President's foreign policy. During my recent visit to the Western White House at San Clemente he instructed me to do everything possible to encourage multinational cooperation in space. Within the next few years we hope to carry out joint programs with the Soviet Union, such as docking an Apollo spacecraft with their Salyut space station.

We have also invited West European countries and others to join us in building the Space Shuttle. While we are anxious to cooperate in space, and have been encouraged by the progress of our talks with the Russians, I also believe we must be backed up by a strong U. S. space program to succeed in these negotiations. There is nothing in the history of postwar US/USSR relations to suggest that the Soviets will be eager to deal with a second-rate power -- in space or on Earth.

I have one final and most important point to make in describing our new businesslike space program for the Seventies. It is this:

We have a major investment program for opening up space in this decade based squarely on the Space Shuttle. Our philosophical approach to space in the Seventies, our technological approach, our budgetary approach all lead to one conclusion: build the Space Shuttle, for it is the key to American productivity and American power in space for the rest of this century.

We can no longer be satisfied with occasional or exotic use of space. We cannot serve the national interest by just dabbling in space. We need the ability to use space routinely and cheaply and extensively for practical benefits. And for this there is no rival, no substitute for the Shuttle.

I look upon the Shuttle as a national undertaking that should unite the people of America not divide them. We must get it moving, this year, not because Florida needs it, not because California needs it, but because America needs it. It is the logical next step forward. The estimated cost of six-year development, $5.5 billion, is about one fourth the cost of Apollo, but it will yield many times the practical benefits.

Perhaps at this point I should pause to tell you more precisely what the Shuttle is and what it will do. Then you may understand better why so much of America's future in space is indeed hitched to the Shuttle.

The Space Shuttle is much more than just a new vehicle. It is a whole new approach to space. It is not a follow-on to Apollo. It is not a follow-on to anything. It builds on present technology, but it is also a breakthrough that has to be made before the costs of using near-Earth space can be significantly reduced, and before this vast new realm above the Earth can become a new home and workplace for Man.

Model.

(SHOW MODEL)

The Space Shuttle will be our first reusable space vehicle.

The Space Shuttle will take off like a rocket, fly in orbit like a spaceship, and land like an airplane.

The Space Shuttle will have two stages: a Booster and an Orbiter. We already have a good idea what the Orbiter will look like, but competing concepts for the Booster are still being considered. A decision is expected shortly. The Orbiter will be about the size of a DC-9 airliner. It will be reusable except for its fuel tank, which will be jettisoned.

The two stages will be joined for a vertical take-off. When they have reached an altitude of say 40 miles, the Booster stage will drop away while the Orbiter stage continues into orbit on its own power. The Orbiter will be highly maneuverable in space and can remain there for as long as necessary to accomplish its mission. Normal missions are planned to last about a week, but if necessary the Orbiter can stay in space for up to 30 days.

When the Orbiter has completed its mission, its two-man crew will fly it back to Earth and land at a designated airport, just as any large airliner would. It will be refitted and fly again and again -- up to 100 times.

The Orbiter will have room for two persons besides the two pilots in the crew compartment. Provision can be made for up to 12 additional passengers in special modules carried in the pressurized payload bay.

The payload bay, or cargo compartment, will be about 15 feet in diameter and up to 60 feet long and will carry loads weighing up to 65,000 pounds. It can carry one very large payload into orbit or a number of smaller ones. Its crew can also pick up payloads from orbit and bring them back to Earth for repair or refurbishment. This is a valuable new capability that we need in order to use space economically. Thus the Shuttle will work productively on both legs of each trip. It will never ride empty. With the Shuttle, operational costs will be slashed dramatically.

Dimensions

The cost of each Shuttle flight will be less than $10 million. This will reduce the costs of putting a pound of payload into space from six or seven hundred dollars at present to less than $100.

cost/Fl.

But the Shuttle will also make other savings possible. Through standardization, we can eliminate many of our present types of launch vehicles. One multipurpose vehicle will now be able to perform the missions that previously required a stable of rockets. More important, we can substantially reduce the cost of designing, building, and

payload savings

operating all kinds of satellites. Satellites will not have to be so restricted in size, shape, and weight. We can use more standard off-the-shelf components. The process of putting spacecraft together and testing them will be simplified. The time it takes to design a new payload for a specific mission may well be reduced from five or six years to five or six months. Moreover, some of the scientists and engineers who build payloads can accompany them into space to deploy them properly and repair them if necessary.

The men and women who will live and work in space in the Shuttle era need not be highly trained test pilots and astronauts. They will travel in shirtsleeve comfort in the pressurized passenger cabin.

How much money the Space Shuttle will save over the next few decades depends, of course, on how much we use it. Keep in mind that reducing the cost of launches and payloads will greatly expand the profitable uses that government agencies and commercial enterprises can make of space. Here we can take advantage of a productivity spiral in which lower costs generate more uses which further reduce costs, and so on.

Now that we have a green light from the President and have completed most of our preliminary studies, we expect to move promptly. This spring we plan to issue a request for proposals from contractors. This summer we will place the Shuttle under contract and development work will start. This work should give direct employment to 50,000 persons when it hits full stride.

All major aerospace firms will be asked to submit proposals. Among the leading competitors are four groups of companies headed by North American Rockwell and General Dynamics; McDonnell-Douglas and Martin Marietta; Grumman and Boeing, and Lockheed.

New Techology for More Profitable Payloads

As noted, the Space Shuttle will be our main program for the development of new technology for space use in this decade. But we will do much more, too. We are already making a substantial investment in new technology for more profitable payloads to be launched and serviced by the Space Shuttle.

We will fly a number of experimental spacecraft in the next few years to advance the technology available for working satellites such as communications satellites, navigation satellites, and weather satellites. In May or June of this year we will fly the first of a new line of working satellites, the Earth Resources Technology Satellites. Here we have an excellent example of how the latest space technology, including advanced sensors of all kinds, will be turned inward on the problems of Earth, including the search for new sources of scarce minerals. Hundreds of experiments have been proposed by scientists from many countries. They range from the discovery of new oil fields to data on melting snows high in the mountains and prompt reports of beach erosion along our coasts. They involve the economy and the ecology; they will give us new tools for better management of Earth resources on a global scale.

We are also investing in new technology for better ground facilities to record and make readily useful the great masses of data and imagery that will be pouring in from our Earth observation satellites. Thus NASA requirements are expected to force new breakthroughs in data processing and computer technology. At the Goddard Space Flight Center we are working on computers that will react to certain images in pictures from space in the same way that the human eye and brain would react -- except much faster. What we are working on is not yet a "thinking machine" but it closely resembles one element of thinking -- that of elementary pattern recognition.

Ground Data

From the beginning, the space program has forced improvements in computer technology much faster than normal business practices would have. Today the computer industry is an $8 billion business which employs 800,000 and is a critical element in our balance of trade.

Computer Tech.

Although NASA is not in the business of operating satellite systems, we work continually to improve the technology available.

operating agencies

Operating agencies like the Weather Bureau (ESSA) and Comsat put the new technology to use. We also welcome the fact that in some fields where we have done much of the pioneering work, such as communications satellites, private industry is able to take over more and more of the new technology development. That enables NASA to move on to other promising fields where private enterprise is not yet ready to take over. Add - Interior, Agriculture, EPA + maybe HEW.

science satellites

HEAO

In this decade we will also step up the capabilities of our unmanned scientific satellites, which now work chiefly in the fields of space physics and astronomy. We will launch the very advanced High Energy Orbiting Observatories in 1975 and 1976. These large Observatories, which weigh 21,000 pounds, will make a complete survey of the heavens to locate all X-ray and gamma ray sources and investigate cosmic rays. These Observatories will also study major high energy sources in detail by training their instruments on them for prolonged periods of time.

Energy Crisis

III Sun & Quasars Pulsars

Doubtless you are quite familiar with the much discussed energy crisis, or as Business Week more carefully defines it, the "energy conversion" crisis. Space research may well give us some of the answers. For example, with these new Observatories, we will seek more information on such mysterious phenomena as Quasars and Pulsars. Little is now known about the physical processes of these powerful sources of radiated energy. The atomic fusion of the Sun is the most powerful source of energy we understand today. But these mysterious bodies far out in the universe radiate thousands of times more energy than the Sun. We would like to understand these processes better, with the hope of putting them to work some day on Earth, or for space travel at near the speed of light. That sounds far-out, I'll admit. But remember, the processes at work in our Sun were a mystery 50 years ago, and only a few astronomers and physicists sought to understand them. Today atomic fission is powering industry and lighting homes, and atomic fusion may soon be brought under practical control. So who can say that Quasar power is out of our reach? One thing we have learned at NASA is that "far-out" predictions frequently prove to have been too conservative!

We can make much more rapid progress in solving these celestial power mysteries when we have the Space Shuttle available for launching and servicing large and complex space observatories. These observatories are just too valuable to be launched with the primitive technology of the Fifties and Sixties. In case you were wondering, primitive is the right word. Our present technology was highly advanced when we first brought it into use, but it became primitive the day we became convinced that a Space Shuttle was feasible -- or at least on the day President Nixon said "Go" on Shuttle development.

Of course, we may wake up one day to find that the mysterious power sources far out in the Universe are less of a mystery to the Russians than they are to us. The Russians have been doing cosmic ray research with a very large satellite -- the Proton satellite -- since 1965. Our new Observatory to be launched in 1975 may be much more productive than anything the Russians will have by that time, but I can't be sure about that.

We are looking into other very advanced ideas for space use which depend on the Shuttle. One that is receiving a great deal of attention at the present time is the possible large-scale use of solar power collected in space and transmitted to Earth by microwave.

On Earth, this solar energy would be converted to electrical power and fed into the Nation's power grids. The technology to make such a system economical is not yet in hand, but the idea is being taken very seriously.

One concept envisions a massive 25-mile square plate of silicon solar cells to catch the sun's energy and convert it to electricity. The entire assembly would weigh nearly five million pounds. Such a system is scaled to deliver 10,000 pollution-free megawatts of electrical power -- enough to supply New York City and its surrounding area.

Other advanced technology work we are doing involves the search for stronger and lighter metals, improved power cells and radio isotope generators, closed ecological systems to support man in space, computers which can repair themselves on 10-year missions to the outer planets, and so on. I don't know of any organization in this country, or anywhere else in the world outside the Soviet Union, that is doing or sponsoring so much work on as many different technological frontiers as NASA's Office of Aeronautics and Space Technology.

We will also push new technology in the three very interesting Skylab missions which will be flown by our astronauts in 1973. Skylab is our first experimental manned space station, similar to but larger and more advanced than the Russians' first space station, the Salyut, which they first used in 1971. Three teams of three astronauts will work in Skylab for a total of five months.

There is not time to discuss the multi-faceted program planned for Skylab but most of the experiments are earth-oriented and designed to test new ways which men and machines in space can perform tasks of critical value to those on Earth.

Lessons to be learned in Skylab will show us how to use the Space Shuttle as an orbiting laboratory; and will put us in a much better position to decide whether we want to build larger, 10-year space stations in the next decade. These larger stations could be built from modules brought up from Earth by the Space Shuttle.

These and other NASA activities clearly will force the development of new technology in computers, cybernetics, power systems, and so on.

The Return on Our Space Investment

Now let me give you an accounting of the return we are getting, and expect to get, from our investment in space exploration and use in this decade.

I am not sure "accounting" is the right word. In addition to practical benefits, the returns we get from our space investment are new scientific knowledge, new technology, enhanced national security, new opportunities for international cooperation and world leadership, and a very special kind of inspiration for the American people at a time when our pride and self-esteem seem to be at a low ebb. How do you assign dollar values to such intangible but very real returns? I can't do it, you can't do it, and neither can the President. You just have to look at the returns as you see them and make a judgement as to whether they are indeed worth three billion dollars a year to the American people and to the future of this country.

Perhaps it's a little easier to make that judgement when you think of three billion dollars as less than 1 1/2 percent of annual Federal expenditures, or less than $15 for each person in the country. That's less than the price of two tickets to a Broadway musical.

1 1/2 % of budget
$15/person

It is easy for some to say that we should take this $15 and use it for such social needs as health care ~~and medicine~~ and education. On the contrary, however, I believe that the $15 spent on an Earth-oriented space program will make a much greater improvement in those two areas than adding it to the ~~$358~~ 700 per person per year now being spent in those fields!

Aside on Medicare/Medicaid - not much improvement in health care at 10's of bill/yr. Good for Hosp. Supply Indust. but most dollars borrowed from other technol. especially NASA

Of course, it is easy to see that the investment we have made in new technology for communications satellites has already greatly increased the volume of commercial communications across the Atlantic and greatly reduced rates. Next will be direct Beast satellites

It is also easy to see that weather satellites pay their own way. You don't have to take NASA's word for it; the Department of Commerce decides that, and it is one of our most eager customers for new technology. It's common sense that improved weather satellites can save farmers and businessmen and highway departments billions of dollars a year. Not to mention the lives and property that can be saved by advance hurricane and typhoon warnings. Within this decade we expect it will be possible to predict weather accurately two weeks in advance. And someday we will learn to control the weather. Imagine if you will the tremendous economic significance of being able to regulate rainfall so that precipitation occurs where and when you want it.

The practical value of Earth resources surveys by satellite will also be demonstrated within a few years as evidenced by the intense interest and cooperation by the Interior and Agriculture Departments. In addition to dollars saved, there will be a rise in confidence that world resource problems and environmental problems can be solved, that we will again have the information we need to control our destiny on this planet. How many billions is that kind of confidence worth to this generation of Americans?

People need to be reminded from time to time that money invested in the space program is not shot off into the unknown. It is spent for wages and salaries right here on Earth. A simple truth, but often overlooked in the heat of debate about new priorities. Money invested in the space program strengthens the Government's ability to manage and support R&D; it strengthens the scientific community and the universities that are training the next generation of scientists; it strengthens the aerospace industry, one of the major resources of this country and our best earner of foreign exchange for high technology products; and of course it stimulates the general economy in a very healthy way, that leaf raking or welfare programs cannot match.

I now come to what I think may be the most important entry on our balance sheet: Space near Earth has become a very important place and will be widely used for vital activities of the modern world. If we do not strengthen our ability to operate there, the Soviet Union will have a virtual monopoly in this vital area and the new technologies associated with it.

I don't believe I need labor this point with this audience. Unless we intend to go out of business as a world power -- and I mean economic as well as military power -- the cost of staying in space must be considered a sound long-term investment.

Earth orbit is an important place to be -- and do business. It affords an unobstructed view of the Universe from above the veil of the Earth's atmosphere which blocks out or distorts much of the available information about the planets, the Sun, and distant stars and galaxies. It gives us a clear view of any place on Earth, and a new perspective on Earth as a whole. It offers line of sight communication between any two points or any number of points on Earth. And it reveals the geological features of whole continents at a single glance.

It offers a hard vacuum and zero gravity for experiments and industrial processes which cannot be reproduced on Earth, except partially and at great expense. I expect manufacturing in space to become a small but very important branch of American industry, where we will make everything from really round ball bearings to pure vaccines and more perfect alloys.

When you consider all the advantages of being in space to stay, and the penalties for dropping out, I think you will agree with me that the $15 per person per year we spend on the space program is one of the best bargains the American people have ever made for themselves. It is an absolutely essential investment in our future as a free and prosperous nation.